Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC. 20554

In the Matter of	**)**	
	)	
Amendment of Part 15 regarding	**)**	**ET Docket No. 04-37**
New Requirements and	**)**	
Measurement Guidelines for Access	**)**	
Broadband over Power Line	**)**	
Systems	**)**	

To: The Commission

Reply Comments from Thomas A. Brown
to the Reply Comments Filed by Thomas A. Brown , May 24, 2004

My referenced reply comment, dated May 24, 2004, detailed my complaints and the apparent inaction of the FCC to take any action to investigate my complaints. Subsequently, I received a letter from the FCC indicating that a field investigation had been conducted. The conclusions stated therein were apparently reached via a subjective leap of judgement and are not supported by the Part 15 Rules or by substantive observations/measurements made by the undersigned conducted following receipt of the FCC letter.

"Notching" as applied to the Progress Energy BPL systems in southern Wake County, NC, is ineffective and does not eliminate harmful interference caused by the BLL system emissions.

I have attached copies of the text of the correspondence received and my reply to that correspondence in support of my further complaint.

Respectfully,

/s/ Thomas A. Brown
Amateur Radio Licensee N4TAB
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n4tab@earthlink.net

Federal Communications Commission
Washington, DC 20554

September 29, 2004

Attn: Mr. Bruce Franca

Response and further complaint

Dear Mr. Franca,

I thank you for your correspondence of July 22, 2004 and appreciate that you accorded sufficient credibility to my previous written complaint, that you and other staff members traveled to investigate this matter. I must say that I am quite surprised that, following a week's time on-site, you were unable to substantiate the details and severity of my compliant. I have considered your remarks in reply to my original complaint and I find the following:

– That your measurements of the "notched" BPL emissions at a site on James Slaughter Road in Wake County, reported by you to be at a level of ~24dB below the Part 15 emission limit for a point source radiator are wholly inconsequential and without merit as regards defining or excusing harmful interference under Part 15. I can find no reference that states that equipment operating under Part 15 with an emission level below some specified value is defined as being "non-interfering". This is a subjective leap of judgement that is unsupported under Part 15 Rules and without precedent. Quite the contrary, Part 15.5 a, b and c clearly states:

§ 15.5 General conditions of operation.

(a) Persons operating intentional or unintentional radiators shall not be deemed to have any vested or recognizable right to continued use of any given frequency by virtue of prior registration or certification of equipment, or, for power line carrier systems, on the basis of prior notification of use pursuant to § 90.63(g) of this chapter.

(b) Operation of an intentional, unintentional, or incidental radiator is subject to the conditions that no harmful interference is caused and that interference must be accepted that may be caused by the operation of an authorized radio station, by another intentional or unintentional radiator, by industrial, scientific and medical (ISM) equipment, or by an incidental radiator.

(c) The operator of a radio frequency device shall be required to cease operating the device upon notification by a Commission representative that the device is causing harmful interference. Operation shall not resume until the condition causing the harmful interference has been corrected.

Note that there is no mention of operating above or below any specified radiated level - <u>whatever</u> - and that any applied definition as such, is unsubstantiated in the Rules and therefore is without merit.

– That the observation that harmful interference was not heard on "a quality Amateur Radio receiver" is without merit. I have repeated my survey of the BPL sites at James Slaughter Road and at Holland Church Road and clearly observed and measured harmful interference at both locations. My comments below illustrate and support this conclusion.

First, to again put this into perspective, I reiterate the comment from my previous complaint, as regards the use of mobile HF equipment in observing and reporting the presence of harmful interference in the BPL sites mentioned. I am not solely reporting interference to an HF mobile radio in the Amateur Radio Service. I am reporting interference to a representative surrogate station operating in the same geographic area. To that end, I also note that my mobile antenna, while resonant, is 90 degrees opposed to the predominant polarization of the power line radiator and, therefore, captures a lesser percentage of the actual harmful interference.

In order to characterize and quantify the emission levels as regards harmful interference, I utilized a "quality Amateur Radio Receiver" and accessories, connected as shown in Figure 1 "Test Apparatus Configuration". For the tests conducted, I first noted the relative noise floor and adjusted the receiver gain to produce a reference reading of 100 mV on the associated Fluke model 77 meter (note that this is an RMS responding meter) at a location about 1 mile north of the BPL system site and within the same geographical area.

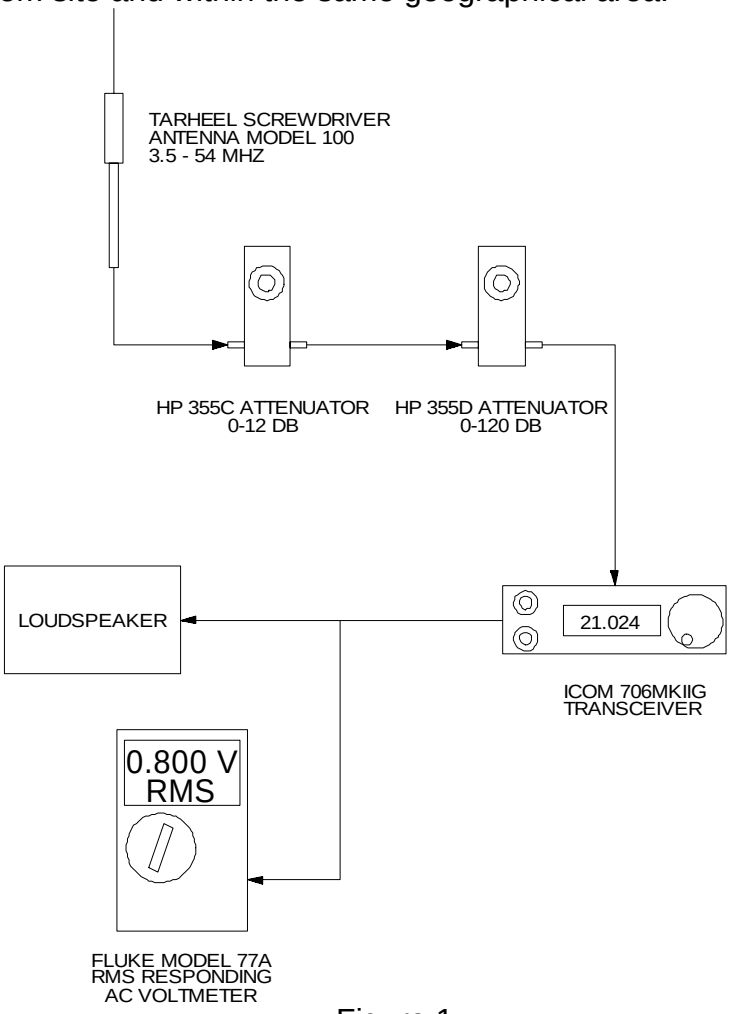

Figure 1
Test Apparatus Configuration

I then drove my vehicle to, and through, the BPL site area and noted the indicated signal level on the meter. A peak RMS level of BPL signal was noted and the vehicle stopped at a location where the value was recorded. RF attenuation was then applied to achieve the original 100 mV RMS reference level. The attenuation level was recorded.

The resulting measurement describes the amount of added RF signals, noise (HARMFUL INTERFERENCE) that results from the operating BPL system in the area of the test. This method was repeated at several locations and on frequencies and at times listed in this report.

The clear outcome of my series of tests is consequential, in that it clearly illustrates and quantifies the level of insult, or harmful interference from the subject systems. It is meaningless to suggest, as was done in your letter of July 22, 2004, that RF levels below some stated carrier level is some value, when that level does not consider the relative noise floor at the subject location. If the FCC observer does not know what level bounds the lower limit of what I can hear, how can he state that I received no interference? Moreover, if he was operating a "quality Amateur Radio Receiver" with a resonant antenna for the frequency of interest, he would have heard exactly what I heard and that am reporting in this correspondence. I am unable to understand why this did not, apparently, occur in the measurements mentioned in your letter.

I also do not see the disparity of measurements and observations as a matter of a difference of opinion. Opinion does not weigh into any interpretation of these observations. Part 15 is clear in its wording and states in an unambiguous fashion, what it intends to be the rules by which enforcement must take place.

It is difficult to understand how FCC personnel with a fully outfitted technical measurement suite of equipment could visit the same sites, examine the same emissions and arrive at a substantially different conclusion. That did, apparently, happen. It is also not clear why your in situ test data was not made available following the field tests.

I also note that you mention having made measurements at 5813 Heathill Court and 509 Wyndham Drive as mentioned in my complaint and that you found no interference. I am at a loss to correlate this as neither of the Amateur licensees can confirm that you listened via their equipment. I can only assume that you made street-level measurements with some sort of mobile antenna at or near the addresses mentioned and were unable to discern any interference. I assert that a street level measurement with a mobile antenna is NOT representative of a similar measurement made with a dipole antenna, elevated above the earth.

Overall, I feel that, somehow, your measurement efforts became distorted and that your conclusions, however well intentioned, fall short of a scientifically supportable investigation. The bottom line, Mr. Franca, resolves to this: under the current Part 15 rules, any device that causes harmful interference and fails mitigation attempts must be shut down. I can find no justification for any other outcome and I, therefore, again respectfully demand that the FCC follow it's own Rules and precedents and issue a Cease and Desist order against Progress Energy Corporation in that matter. That Progress Energy Corporation supposes that it might shut down the BPL systems over time is of no consequence. These

systems do, today, produce harmful interference and must be shut down immediately. The attempts at "notching" are not effective in removing harmful interference emitted by the subject BPL systems.

Beyond this, I further note that **although access BPL is a Part 15 emitter and NOT a Shared Service, it should AT LEAST be mandated to follow Commission Rules in Shared Service situations where the Secondary emitter is not permitted to raise the interference level above 1 (one) dB. A recent NTIA report indicated that even a 1 dB increase in noise poses a slight risk of harmful interference. Clearly, a 14 dB increase will interfere with many signals that are routinely used in the Amateur Radio Service.** Clearly, as shown in my observations, the BPL signals are at least 14 dB above an average background level. That they might be 24 dB below some stated level suggests that the BPL system operator/manufacturer is short of the needed interference attenuation by at least 14 dB. Further, as the particular reference locations within these tests were not electrically "quiet" in a general sense, it follows that achieving a non-interfering status in a more quiet location would require more than the aggregate 38 dB of notch depth suggested by my test alone; indeed, as much as 45 dB or more will likely be required.

Should you or your staff wish to again visit the subject BPL trial areas, with reasonable notice, I will be happy to meet with you and escort you through these areas, while you operate my equipment and observe the harmful interference in the same manner that I have done.

Respectfully,

Thomas A. Brown
Amateur Radio Licensee N4TAB
5525 Old Still Rd.
Wake Forest, NC 27587

Attachments:
Representative List of Offending BPL Signals At Several Sites in South Wake County, NC
Text of my original complaint of April 27, 2004
Text of B. Franca letter of July 22, 2004

Representative List of Offending BPL Signals
At Several Sites in South Wake County, NC

The measurements and observations listed in this document were made on August 29, 2004. Measurements were made using the apparatus as shown in Figure 1 of the related document to which this is attached.

NOTE THAT WHILE MANY FREQUENCIES WERE OBSERVED AS HAVING HARMFUL BPL INTERFERENCE, ONLY A FEW ARE LISTED HEREIN.

Holland Church Road - overhead BPL system. On frequency 21024 kHz, BPL carriers produced an offending and harmful interference at distances of more than 30 feet from the "injected" power line, with radiation peaks occurring periodically along the line and not just at the injector point. The level of attenuation required to reduce the offending BPL signal to the equivalent background noise level was 16 dB.

Feldmen Rd. - underground BPL system. Observations and measurements were made on Feldmen Rd., which is a part of the Holland Church Rd. system.
At 1140 Feldmen Rd., within 50 feet of a ground mounted pedestal, harmful BPL signals were observed on 3869 kHz and required 16 dB of attenuation to reach the equivalent background noise level.

1505 Harvey Johnson Rd., one block North of 1140 Feldmen Rd., the 3869 kHz signal was heard at the same level as near the 1140 Feldmen Rd pedestal and also required 16 dB of attenuation to reduce the harmful interference to the equivalent background noise level.

Holland Church Rd. at the Donneymead intersection, there was sufficient BPL carrier on 3869 kHz to require 13 dB of attenuation to reduce to the equivalent background noise level. Note that this is several blocks removed from the emitter.

James Slaughter Rd. Overhead BPL system feeding underground systems at Woodchase and Whitehurst subdivisions. Near the entrance to the Woodchase subdivision, offending BPL carriers were observed at 24890 - 24990 kHz and 7296 kHz, both of which required 16 dB of attenuation to reduce to the equivalent background noise level.

Interestingly, I noted that the 12 meter (24890 - 24990 kHz) signals were propagated for more than 1 mile along Hwy 55 (W) at least to Dickens Rd. All along the route along Hwy 55 to Dickens Rd. and NE on Dickens Rd. to the intersection with James Slaughter Rd. the BPL interference was at a sufficient level to require 16 dB of attenuation to reduce the BPL signal to the equivalent background noise level.

Attachment: Copy of my formal complaint of April 22, 2004

To:
James Burtle, FCC
Alan Stillwell, FCC
Ann Wride, FCC
Riley Hollingsworth, FCC
Len Anthony, Progress Energy Corporation
Matt Oja, Progress Energy Corporation
Bill Godwin, Progress Energy Corporation
Chris Imlay, ARRL Counsel

Date: April 27, 2004

This complaint addresses the Progress Energy (Raleigh, NC) BPL trial areas situated along James Slaughter Road in southern Wake County, NC. This complaint should be considered in concert with previous complaints lodged with Progress Energy and The Federal Communications Commission regarding interference by devices operating under FCC Part 15 and which radiate harmful interference into the RF spectrum allocated to, and used by licensees of the Amateur Radio Service.

Notwithstanding previous efforts by Progress Energy and it's vendor, Amperion, Inc. to resolve outstanding complaints regarding interference to Amateur Radio spectrum, a recent correspondence from Mr. Len Anthony of Progress Energy states that his company's efforts had yielded results suitable to Progress Energy and that they would take no further action in this regard. This correspondence coldly and effectively terminates the good faith relationship that was engendered in October, 2003 with a view toward a cooperative effort that might yield a technical solution to an otherwise mutually adversarial situation.

In assessing the current technical aspects of the Progress Energy BPL trials, I believe that the interference described in this and previous complaints falls under Part 15 for the following reasons:

1) The Experimental license WD2XCA issued to Progress Energy (file number 0011-EX-PL-2003-granted February 10, 2003) allows operation of an experimental
radiator within a 20 mile radius of the coordinates N35:56:58, W78:34:23. None of the 3 trial sites in southern Wake County are within this radius.

2) Mr. Len Anthony's correspondence of April 20, 2004 specifically refers to FCC Rules, Part 15 as their model for compliance.

Therefore, my complaint is that Progress Energy's BPL trial site(s) emit radiated RF components that are harmful to the spectrum allocated to the Amateur Radio Service by the FCC and also provided under international treaty.

In preface to the specifics of my complaint, I would like to put into perspective, the use of an Amateur Radio HF mobile radio in the trial areas. As it is remarkably convenient that there are only a small number of Amateur Radio operators geographically situated near the trial areas to hear the BPL signals from their homes, we have been,and are, using mobile HF equipment in the place of fixed installations in order to gauge the impact of interference in the respective geographical areas. Thus, an HF mobile radio, in the current context, is a "stand-in" for a fixed station at or near the same geographic location. It should be noted that, due to the generally poor efficiency and polarization of the HF mobile antennas, the results reported herein significantly *under-represent* the signal levels that would be encountered by fixed stations using horizontally polarized antennas, such as wire dipoles or directional arrays, operating in the same vicinity.

On Sunday, April 25, 2004, I drove my vehicle to the James Slaughter Road trial-site area. Upon arrival near the entrance to the Whitehurst residential subdivision, I began tuning through the allocated Amateur Radio bands and immediately observed significant interference to the 12 meter band, which extends from 24.890 mHz to 24.990 mHz. The interference was sufficient to mask, and did mask, useful signals that were clearly heard away from the BPL trial area. That the unique RF "signature" of the Progress Energy equipment completely blankets and renders useless an otherwise useful spectrum segment, clearly constitutes harmful interference.

This interference accrues into other portions of the allocated Amateur Radio HF spectrum, as well. Within the Whitehurst and Woodchase subdivisions (both adjacent to James Slaughter Road) BPL interference can be heard in the lower 25 kHz of the 10 meter band (28.000 mHz to 28.025 mHz).. In addition,
near the entrance to the Whitehurst subdivision, the entire 40 meter band (7.000 mHz to 7.300 mHz) is obscured by BPL interference. This interference does not radiate from the overhead wires alone; radiation also occurs from the pedestals where the underground wiring connects to customer distribution equipment.

Note that this interference is not confined to a single, narrow tone (carrier) as would be experienced from a typical Part 15 device such as an answering machine. This BPL interference signature consists of carriers spaced at approximately 1 kHz intervals through the entire 12 meter band, rendering normal communications operation impossible.

Where apparent attempts by Progress Energy to vacate the Amateur Radio spectrum have occurred in these systems, it has become obvious that the characteristics of any built-in "mitigation" filters do not exhibit "sharp" edges and that the "granularity", or precision with which any such filters can be defined and applied, is quite coarse. That is to say, that it seems that it is not possible to apply a "brick wall" filter topology, cleanly "notching" spectrum segments, rather, the filter "corner" must be set (possibly empirically) considerably away from the desired edge of the spectrum to be avoided. This observation suggests that the oft-touted claims of an "adaptive mitigation" process are overstated, at best.

Members of the local Amateur Community, including the undersigned, have waited patiently for several months while Progress Energy and it's vendor have attempted, in fits and starts, to remove the allocated Amateur Radio spectrum from that spectrum utilized by their installed BPL systems. The result, after these months of observation, is that Progress Energy has not caused these systems to cease interference to the Amateur Radio spectrum.

There is a single conclusion that can be drawn from the history of this situation: interference from this type of system is a function of the design and cannot be mitigated, else it would have been accomplished by now. Further, it seems that this technology is quite immature and inherently lacking the technological merits so widely accorded it, owing to the lack of success following months of efforts toward effecting a solution.

FCC part 15 rules quoted below state that:

§ 15.5 General conditions of operation.

(a) Persons operating intentional or unintentional radiators shall not be deemed to have any vested or recognizable right to continued use of any given frequency by virtue of prior registration or certification of equipment, or, for power line carrier systems, on the basis of prior notification of use pursuant to § 90.63(g) of this chapter.

(b) Operation of an intentional, unintentional, or incidental radiator is subject to the conditions that no harmful interference is caused and that interference must be accepted that may be caused by the operation of an authorized radio station, by another intentional or unintentional radiator, by industrial, scientific and medical (ISM) equipment, or by an incidental radiator.

(c) The operator of a radio frequency device shall be required to cease operating the device upon notification by a Commission representative that the device is causing harmful interference. Operation shall not resume until the condition causing the harmful interference has been corrected.

Progress Energy is operating equipment under the terms of Part 15.5a, b and c above, and is subject to the restrictions therein.

I, therefore, respectfully demand that the Federal Communications Commission take the action specified under Part 15.5c and cause Progress Energy to cease operation of the Part 15 devices mentioned in this correspondence.

Respectfully,

Thomas A. Brown Amateur Radio licensee N4TAB
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Wake Forest, NC

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919-528-3104 (h)
n4tab@earthlink.net

Attachments:

Previous complaints made to Progress Energy
Previous complaints made to the FCC
Copy of Mr. Len Anthony's email as referenced above

[Revision note: Paragraph 9 had two typographical errors that were subsequently mentioned in a follow-on errate email. Corrections were made in the foregoing paragraph 9 (only) and are underlined in both cases.}

Attachment: Copy text of letter received from Bruce Franca dated July 22, 2004

Thomas A. Brown, Amateur Radio Licensee N4TAB
5525 Old Still Rd.
Wake Forest, NC

Dear Mr. Brown:

This responds to your correspondence dated April 27, 2004, concerning a complaint with regard to harmful interference to Amateur Radio Service operations from Progress Energy Corporation's Broadband over Power Lines (BPL) trials in Southern Wake County, North Carolina. You state that on April 25, 2004, you drove your vehicle to the James Slaughter Road area and observed that the BPL trials being conducted by Progress Energy in that area "emit radiated RF components that are harmful to spectrum allocated the Amateur Radio Service." You state that the unique RF "signature" of the Progress Energy BPL equipment completely blankets, and therefore causes harmful interference to, several Amateur HF bands.

During the period June 28 and July 2, 2004, personnel from the FCC's Office of Engineering and Technology and Enforcement Bureau, including myself, traveled to North Carolina and undertook extensive testing and measurements of Progress Energy's BPL system deployed near Raleigh in the areas described in your complaint. We first conducted compliance testing of BPL overhead injectors on Slaughter Road and on Holland Church Road. In both instances, these devices were found to be in compliance with the FCC emission limits.

As part of these measurements, we examined the effectiveness of Progress Energy's steps to "notch" its BPL signals to avoid harmful interference. Section 2.1 of the Commission's rules defines harmful interference as "[i]nterference which … seriously degrades, obstructs, or repeatedly interrupts a radiocommunication service," 47 C.F.R. § 2.1. The notch depth of the Holland Church Road injector was measured in two ways: 1) evaluating spectrum band averages using a bicon antenna and 2) evaluating OFDM peaks using a loop antenna. The results of these measurements indicated a notch depth of 23.4 to 25.0 dB below the Part 15 limits, with an average of 24 dB below. Given the relatively low levels of emissions permitted by BPL systems under the Part 15 rules and the distribution and propagation of the BPL signals of the Progress Energy system, notching at this level is sufficient to eliminate any signals that would be deemed capable of causing harmful interference, including interference to amateur operations. Measurements and observations with test equipment and a high quality amateur receiver show little field strength or observable signal levels in the notched bands. In no instances were signal levels found that would

cause serious degradation, obstruction, or repeated interruption of the communications of amateur mobile stations or the fixed stations identified in your complaint. We did, however, find that the notching in the 10 meter band as implemented by Progress Energy allowed somewhat higher levels of signal in the lower 100 kHz at 28.0-28.1 MHz than the 24 dB notching reduction generally observed.

We next investigated emissions from the BPL system deployed in the vicinity of the Whitehurst subdivision, where the system is deployed using underground wiring. No BPL signals were detected in this area that would be deemed capable of causing harmful interference to mobile amateur operations.

Finally, we took measurements at two fixed amateur locations, 5813 Heathill Court and 509 Wyndham Drive, included in the complaint. No BPL interference was observed on any amateur frequencies at these two locations. In fact, no BPL signals were observed at these locations on any of the frequencies used for BPL operations by Progress Energy. A third site included in the complaint, at 201 Wilbon Road 301B, was not visited due to a GPS mapping error and subsequent time constraints.

Our conclusions from this investigation are that the Progress Energy BPL trial in the Raleigh area is in compliance with the Commission's rules and that the measures implemented to notch frequencies used by the Amateur Radio Service to avoid the potential for harmful interference are effective. We neither found nor observed any BPL signal levels or effects from the Progress Energy BPL operation that appeared to have the potential to seriously degrade, obstruct or repeatedly interrupt mobile amateur communications or fixed amateur communications at the specified addresses. In a separate action, we are however instructing that Progress Energy and Amperion, its equipment vendor, to slightly widen the notch at the lower edge of the 10 meter band by 100 kHz to ensure protection of amateur operations at 28.0-28.1 MHz.

Sincerely,

Bruce A. Franca
Deputy Chief,
Office of Engineering and Technology

cc: George Dillon, FCC/EB
Riley Hollingsworth, FCC/EB
Len Anthony, Progress Energy Corporation
Matt Oja, Progress Energy Corporation
Bill Godwin, Progress Energy Corporation
David Sumner, President, ARRL
Chris Imlay, Counsel, ARRL